**Client:** Davesmen India Private Limited

# Dynamic Distancing System with FMCW based Brigade BS-9000 RADAR Sensor For



# Operating Manual for Radar Sensor's CAN Host Operation

**Developers:**

Mr. Debashis Chatterjee (AntiZero)

In Association with

Mr. Biswajit Majumder (Electron)

# Dynamic Distancing System with FMCW based Brigade's BS-9000 RADAR Sensor

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**Working Principle & Technical Approach:** Brigade's Backsense uses FMCW (Frequency Modulated Continuous Wave) radar system technology that is designed to detect people and objects in blind spots, significantly reducing collisions. Backsense detects both stationary and moving objects and works effectively in harsh environments with poor visibility including darkness, smoke, fog and dust.

The Developed System, engineered by AntiZero, harnesses the integration of Brigade's 4 Backsense FMCW-based RADAR units with GPS and other electronic peripherals. This advanced system is capable of achieving remarkable capabilities in object detection and situational awareness. With its powerful combination of Backsense RADAR technology and GPS functionality, the Developed System by AntiZero becomes a robust solution for dynamic object detection. The FMCW-based RADAR units offer exceptional accuracy in identifying both stationary and moving objects, ensuring comprehensive coverage, and minimizing the risk of collisions.

Moreover, with the integration of GPS, the system gains precise location information, further enhancing its object detection and tracking capabilities. By constantly monitoring the surroundings and dynamically detecting objects, the Developed System by AntiZero excels at improving safety and reducing potential hazards. This cutting-edge system provides an invaluable tool for industries and applications where safety and situational awareness are of paramount importance. With AntiZero's expertise and the advanced integration of Brigade's Backsense RADAR units, GPS, and other electronic peripherals, the Developed System delivers impressive performance and reliability.

The system includes the following features:

1. Acquisition & Diagnostic of High-Speed CAN Data
2. Five-Level Zone Indication with User-Programmable Collision Avoidance Settings
3. Onboard USB Data Logging Capability (Over 90 Hours)
4. Four-Channel LED Indication for Four Radar Sensors
5. Vehicle Forward & Reverse Detection
6. Onboard GPS-Based Location, Speed Tracking and Logging
7. Real-Time Calculation of Dynamic Distance Proportional to Vehicle Speed
8. Audio-Visual Zone Indication
9. Zone Setting Software for PC-Based Configuration
10. Indication of faults in the sensor and GPS.
11. Option to mute the buzzer for 6 seconds.

**Electrical Specification:**

1. **Operating Voltage:** The device operates within the voltage range of 9-15V DC, ensuring compatibility with standard power sources.
2. **Input Current:** The device requires a maximum input current of less than 200mA, resulting in efficient power consumption.

**Protections:**

1. **Short Circuit Protection:** The device is equipped with built-in safeguards to protect against short circuits, minimizing the risk of damage or malfunctions caused by electrical faults.
2. **Over Voltage Protection:** The device incorporates a protective mechanism that prevents damage from occurring due to voltage spikes or excessive voltage levels, ensuring reliable operation even in unpredictable electrical conditions.

To set up the system, follow these steps:

1. Begin by installing the "Radar Settings" software onto your PC. This software is essential for configuring and customizing the radar system.
2. Locate the installation files for the "Radar Settings" software, which can typically be found on a CD-ROM or downloaded from a designated website.
3. Run the installation program and follow the prompts to install the software onto your PC. Ensure that you meet any system requirements specified by the software.
4. Once the installation is complete, launch the "Radar Settings" software on your PC.

By successfully installing the "Radar Settings" software onto your PC, you will gain access to the necessary tools and functionalities to configure and optimize your radar system.
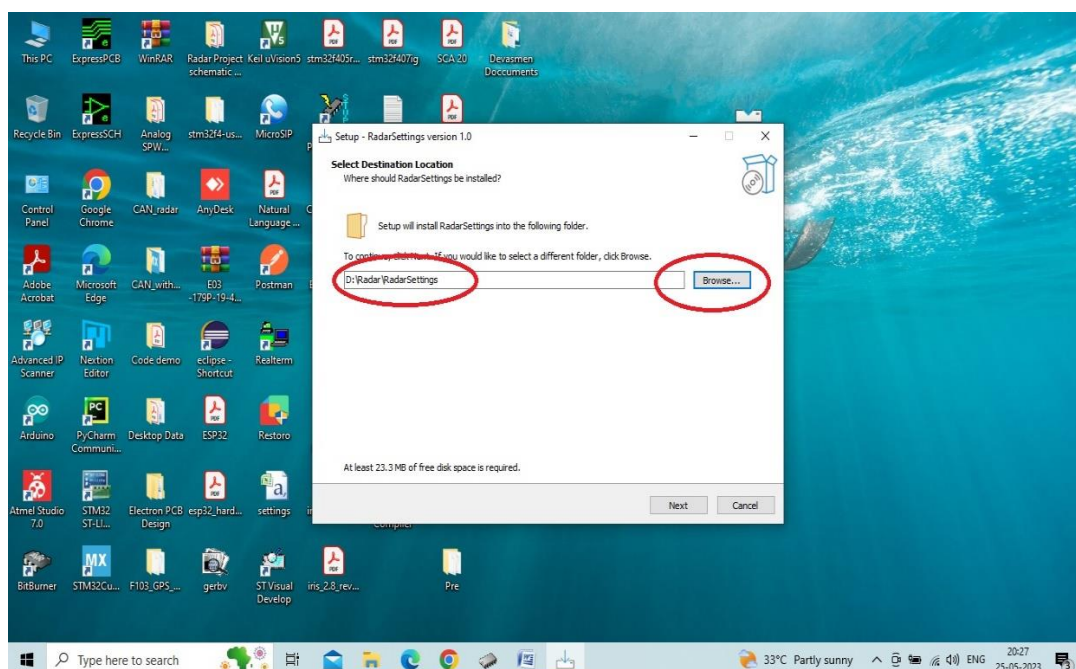


*Fig 1. Software Installation: Selecting an Alternative Drive for Installation.*

During the installation process, choose a drive other than the "C drive" on your computer to install the software. This will ensure that the software is stored in a location of your preference.

1. Select the desired drive when prompted by the installation wizard, ensuring that it is different from the default "C drive" option.
2. Proceed with the installation process, following the prompts and providing any necessary information or permissions.
3. Once the installation is complete, you will have the software installed on the designated drive. After a successful installation, a desktop icon named "Radar Settings" will appear on your desktop.

By installing the software on a drive other than the "C drive" and accessing the "Radar Settings" desktop icon, you will be able to conveniently launch the software and access its features for configuring and customizing your radar settings.



*Fig 2. Access Radar Settings: Click on the "Radar Settings" desktop icon.*

Upon clicking the "Radar Settings" desktop icon, you will be presented with a dialog box, which will appear as follows:

The dialog box serves as an interface for interacting with the software and accessing its various functionalities. It provides you with a graphical user interface (GUI) where you can configure and adjust the radar settings according to your preferences.

Within the dialog box, you will find a range of options and settings that allow you to customize the radar system to meet your specific requirements. These may include parameters such as detection sensitivity, zone configuration, collision avoidance settings, and more.

By utilizing the dialog box, you can conveniently navigate through the available options, input desired values, and make necessary adjustments to fine-tune the radar system's performance.

It is important to explore and familiarize yourself with the dialog box to effectively utilize the features and capabilities offered by the software. Through this user-friendly interface, you will have full control over the radar settings, empowering you to optimize its functionality and adapt it to your specific needs.
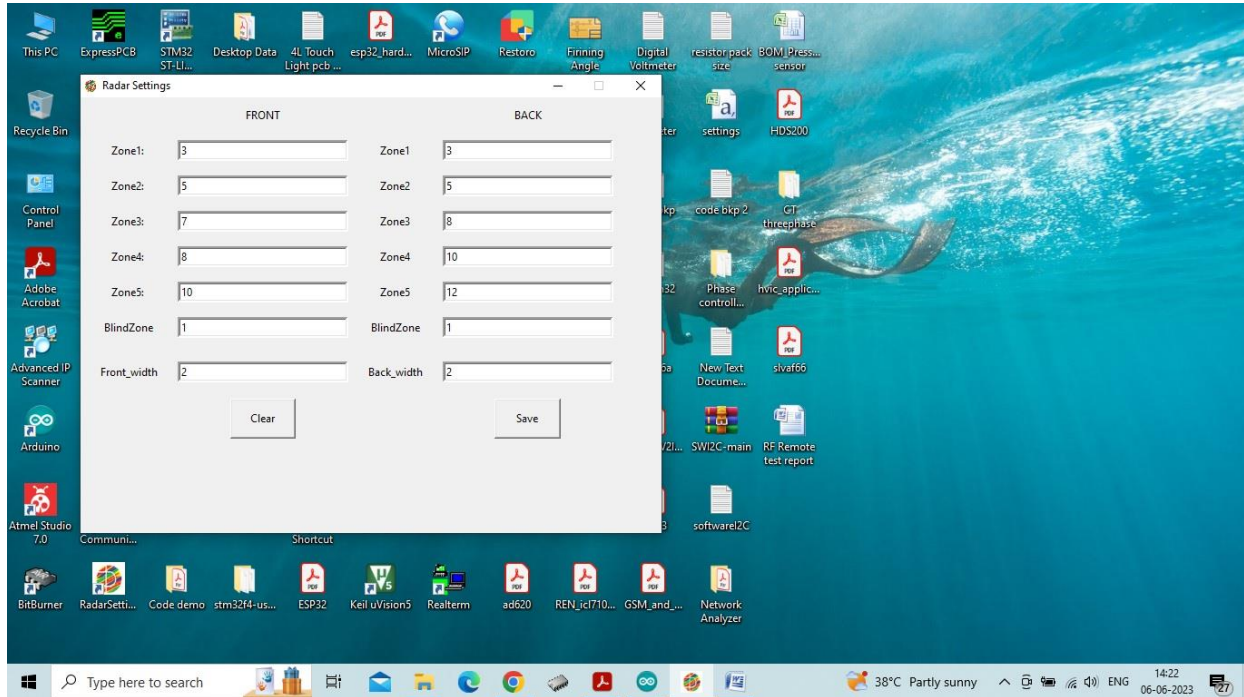


*Fig 3. Zone Customization: Adjusting Zones in the Software's Dialog Box.*

To customize the zones according to your specific needs, follow these steps:

1. Within the software's dialog box, locate the zone configuration section. This section will provide options for defining and adjusting the zones.
2. Fill in the zone values based on your requirements. This may include specifying the range, sensitivity, or other parameters related to each zone.
3. Once you have entered the desired zone settings, click on the "Save" button within the dialog box. This action will save your customized zone configuration.

By filling the zones as per your requirements and clicking on the "Save" button, you ensure that your preferred settings are stored and applied to the radar system. This customization allows the radar system to accurately detect and respond to objects or obstacles within the defined zones, providing you with a tailored solution for collision avoidance or any other specific purpose.

Remember to review and confirm your zone settings before saving to ensure they align with your desired specifications.
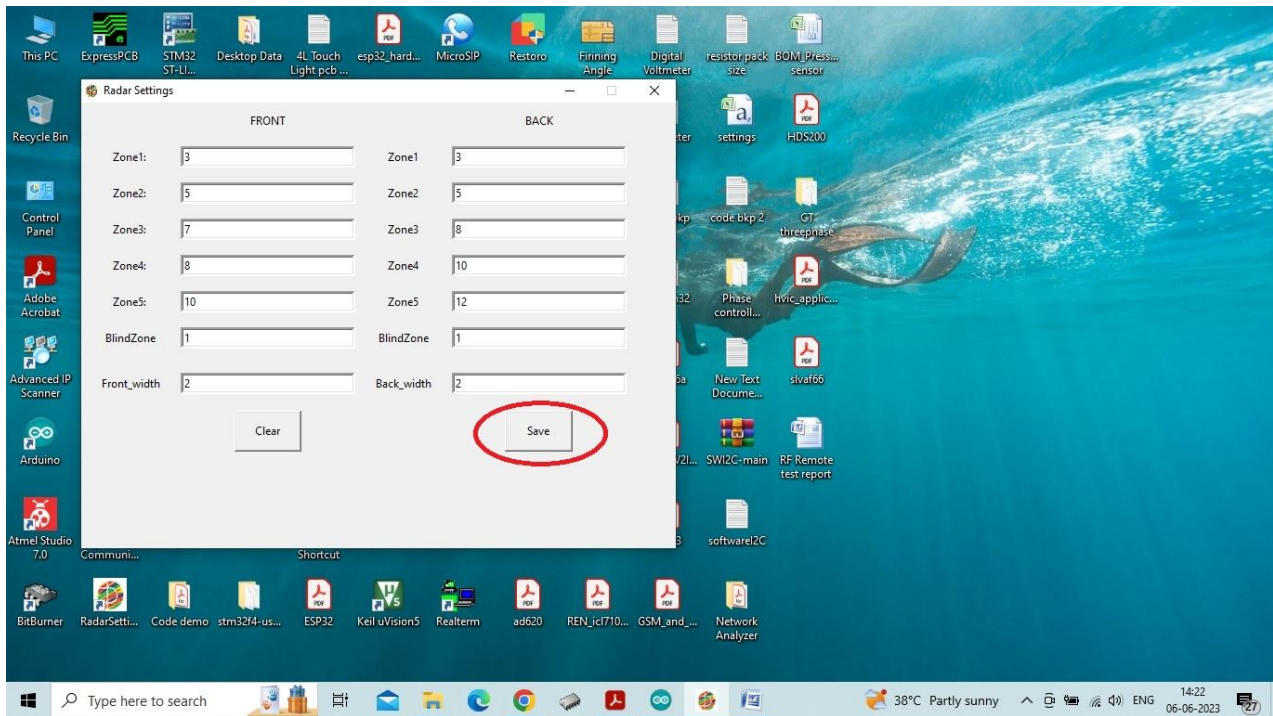
*Fig 4. Saving Customized Zone Settings: Preserving & Applying Preferred Configuration to the Radar System.*

After completing the customization of your zone settings, a settings.csv file will be automatically generated and saved in the installation folder of the software. This file can be located by navigating to the designated folder as indicated below:

Upon opening the installation folder, you will find the settings.csv file readily available. This file serves as a record of your customized zone settings, allowing you to review or share the configuration if needed.

The settings.csv file is typically in a comma-separated values format, making it easily readable and editable with common spreadsheet software. It contains the specific values and parameters that you have defined for each zone, providing a comprehensive snapshot of your customized radar configuration.

By having access to the settings.csv file, you can conveniently store and reference your customized zone settings, making it easier to restore or modify them in the future.
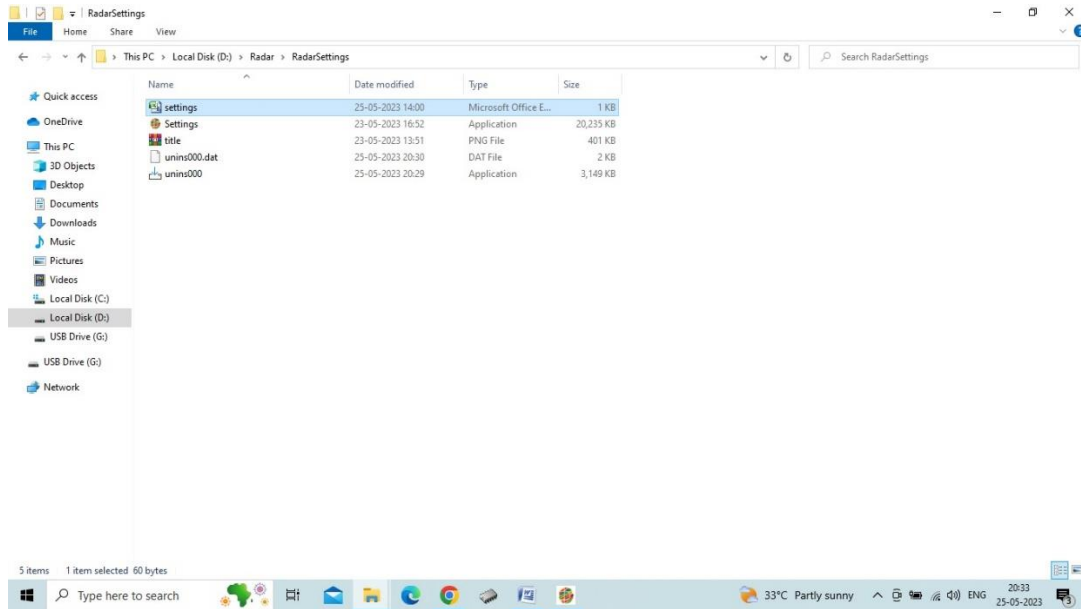
*Fig 5. Generated settings.csv File: Locating the Automatically Generated Configuration File in the Installation Folder.*

To review the zone values, follow these steps:

1. Locate the generated settings.csv file in the installation folder of the software.
2. Open the settings.csv file using a compatible spreadsheet software, such as Microsoft Excel or Google Sheets.
3. Once the file is opened, you will see a tabular representation of the zone values. Each row corresponds to a specific zone, and each column represents different parameters associated with the zones.
4. Review the zone values within the spreadsheet. This includes examining the range, sensitivity, or any other parameters that were configured for each zone.

By opening the settings.csv file and checking the zone values, you can ensure that the customization you applied during the configuration process has been accurately recorded. This allows you to verify and confirm the specific settings for each zone, providing you with a clear understanding of how the radar system is configured to detect and respond to objects within different zones.

Make any necessary adjustments or modifications to the zone values within the spreadsheet, save the file if desired, and refer back to it whenever you need to review or update your zone settings.
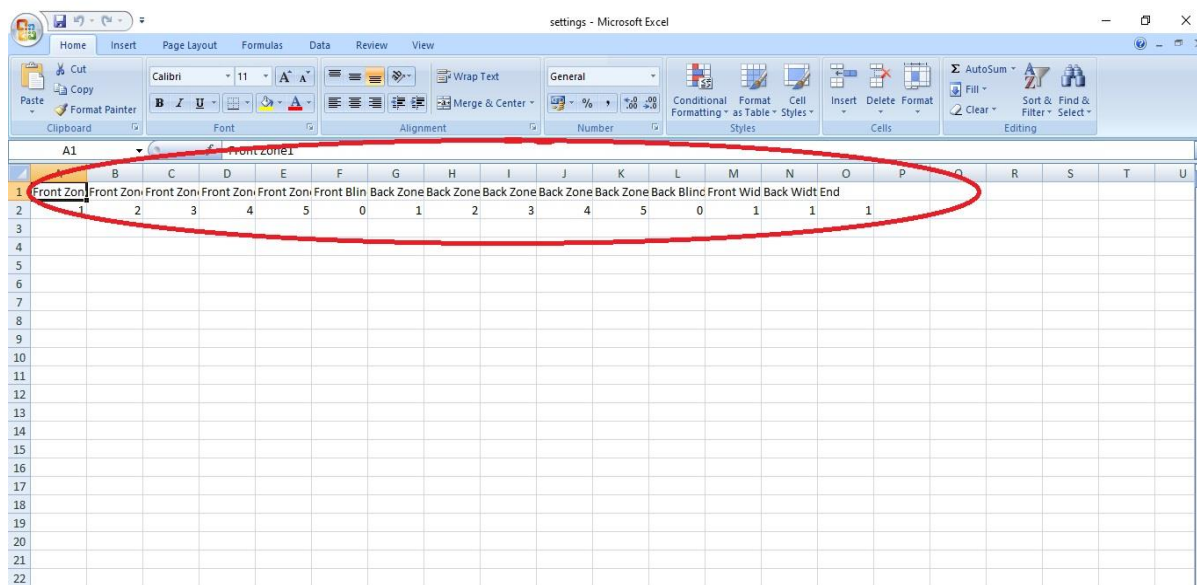
*Fig 6. Verifying Zone Values: Accessing and Reviewing the settings.csv File for Customized Configuration.*

To configure the zones, follow these steps:

3. Prepare a USB flash drive and copy the "settings.csv" file onto it. Ensure that the file contains the desired zone values.
4. Insert the USB flash drive into the USB socket of the Host system.
5. Upon system startup, the Host will automatically read the "settings.csv" file from the USB drive.
6. Using the information provided in the CSV file, the Host will then configure the zones accordingly, setting them to the specified values.

By following these instructions, the Host system will utilize the "settings.csv" file stored on the USB flash drive to establish the desired zone settings upon startup.

To install the HOST system, please follow these steps:

1. Begin by inserting the USB flash drive into the USB socket of the system, ensuring it is securely connected.
2. Next, establish a connection between the Host and the CAN BUS, which allows for data exchange and communication.
3. Connect the LED Display board to the Host system, ensuring all necessary cables are properly connected.
4. Attach the GPS Module to the Host system, ensuring a secure and reliable connection.
5. Power on the entire system by supplying the necessary power to the bus.
6. Within a few seconds, the HOST system will initiate and begin its startup process.

By carefully following these installation steps, you will successfully set up the HOST system, allowing it to function as intended.
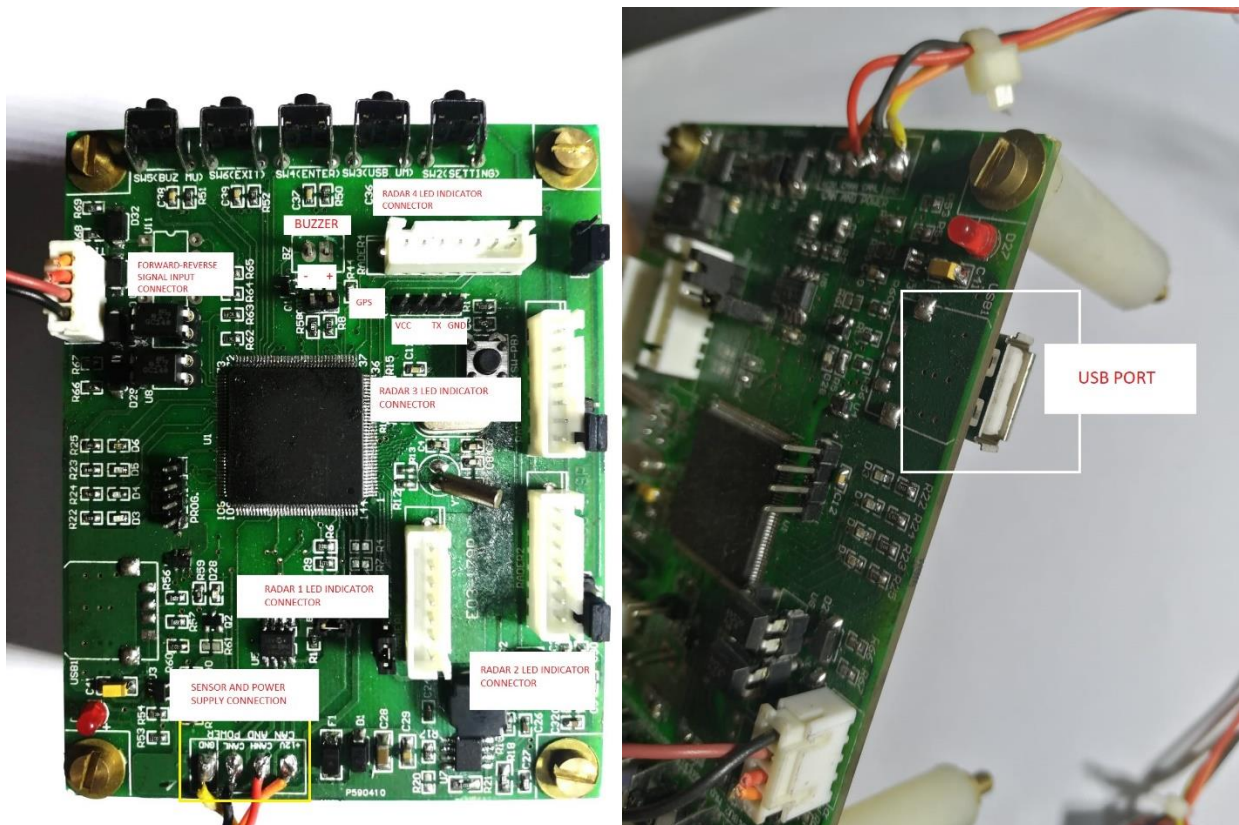


*Fig7. Front View of the Dynamic Distancing System (Left) | Onboard USB Data Logging: Dynamic Distancing System (Right)*